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(71) Applicant
Karsten Laing
Hofenerweg 37, 7148 Remseck-2,
German Democratic Republic

(72) Inventor
Karsten Laing

(74) Agent and/or Address for Service
Venner Shipley and Co
368 City Road, London, EC1V 2QA, United Kingdom

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(56) Documents cited
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(58) Field of search
UK CL (Edition J) F4A, F4U
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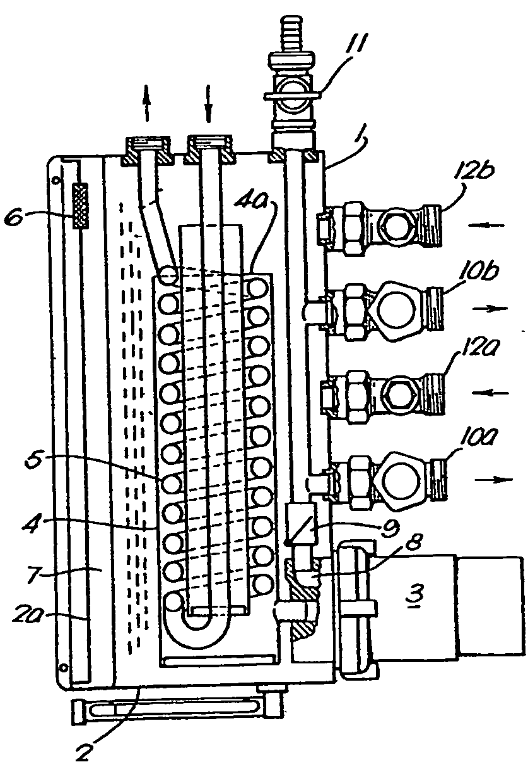
(54) Heat exchange station

(57) A heat exchange station for use in a central heating system includes a heat exchanger (5) that receives hot water from a boiler (not shown) to heat water in an open-ended casing (4) which communicates with an expansion tank (2) for a secondary circuit including room radiators or the like (not shown). A pump (3) produces flow in the secondary circuit. The pump (3) expansion tank (2) and heat exchanger (5) are arranged as a single unit. A pressure release valve (6) is provided in the tank to vent any gas that releases from the water in the secondary circuit.

FIG.1



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy

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FIG.1

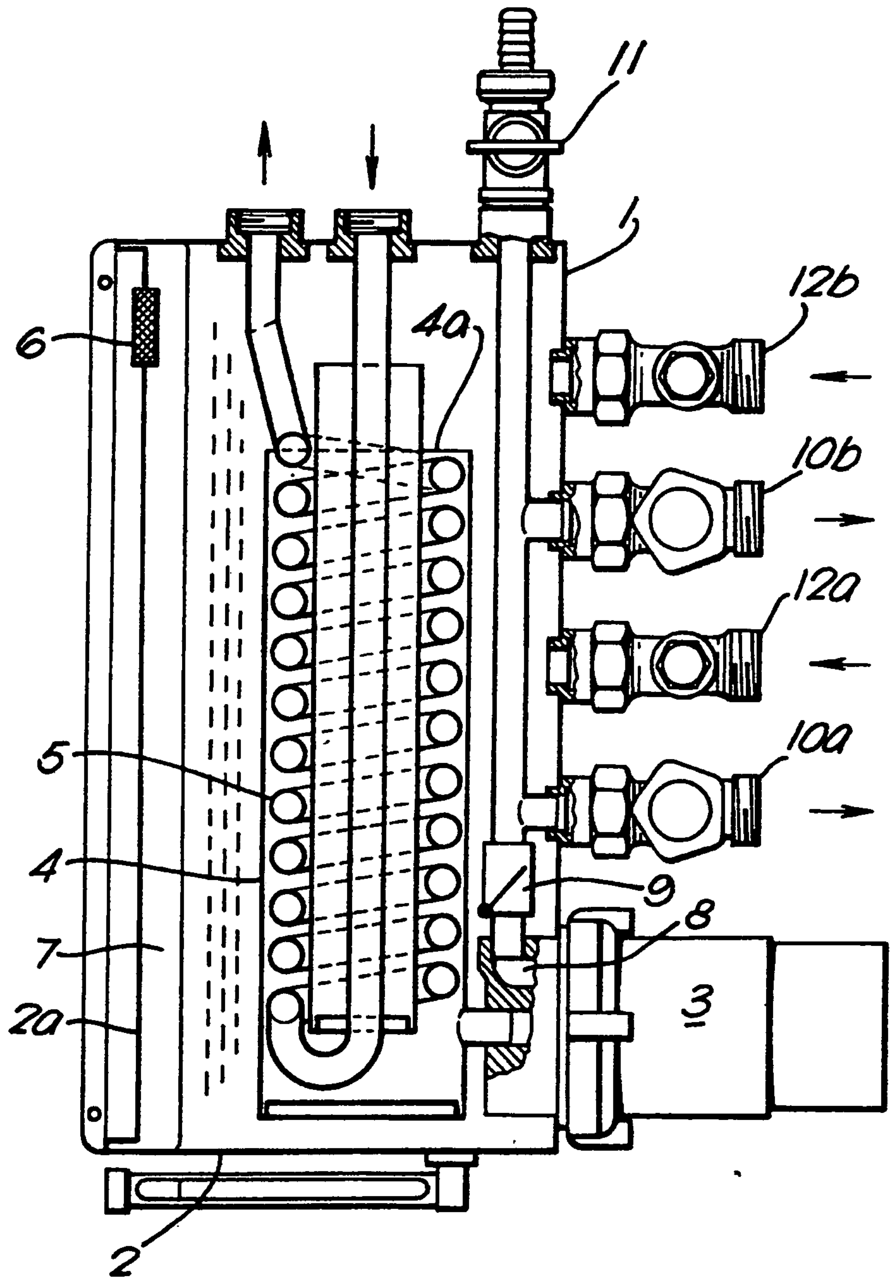

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FIG. 2

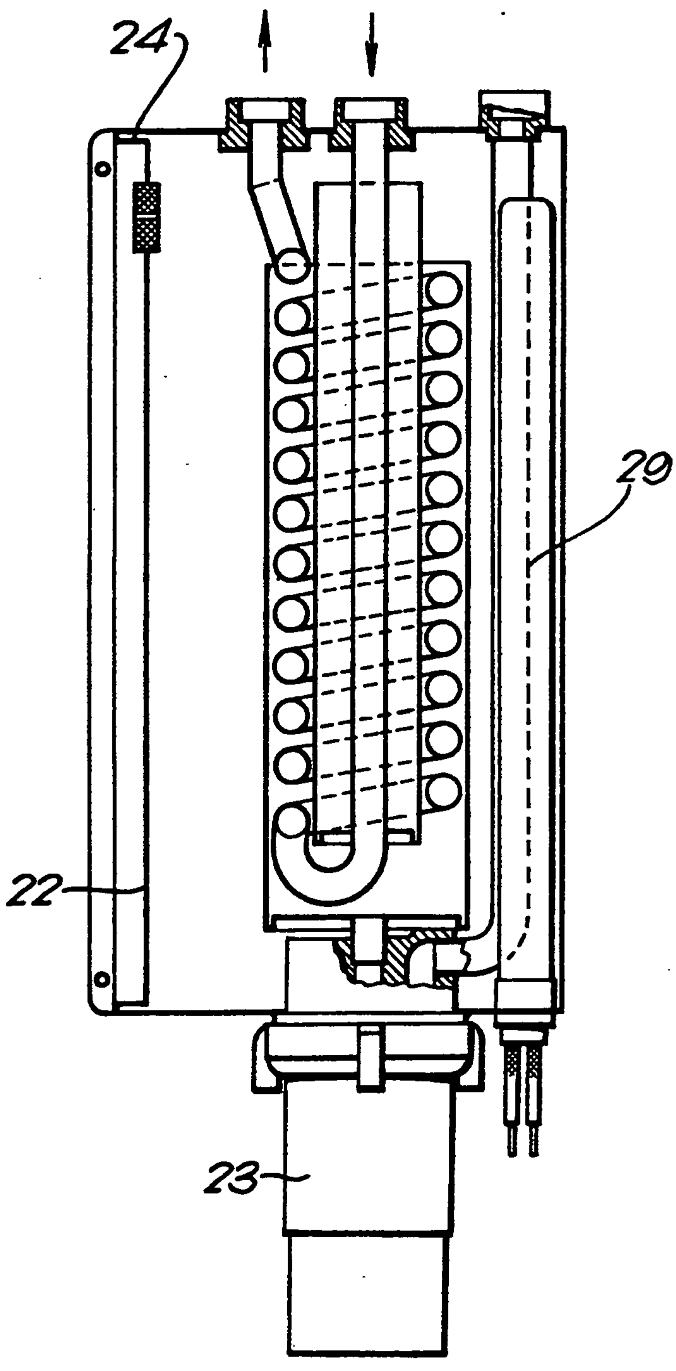
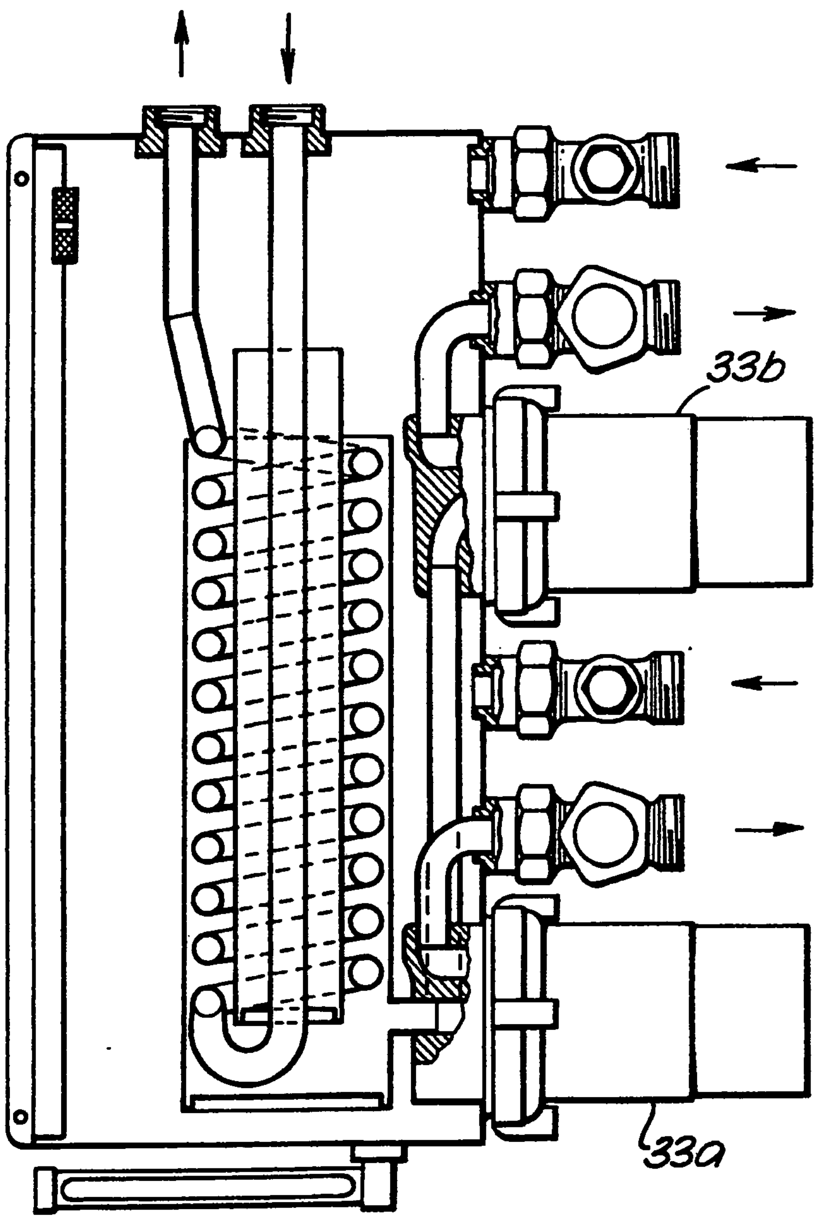


FIG. 3



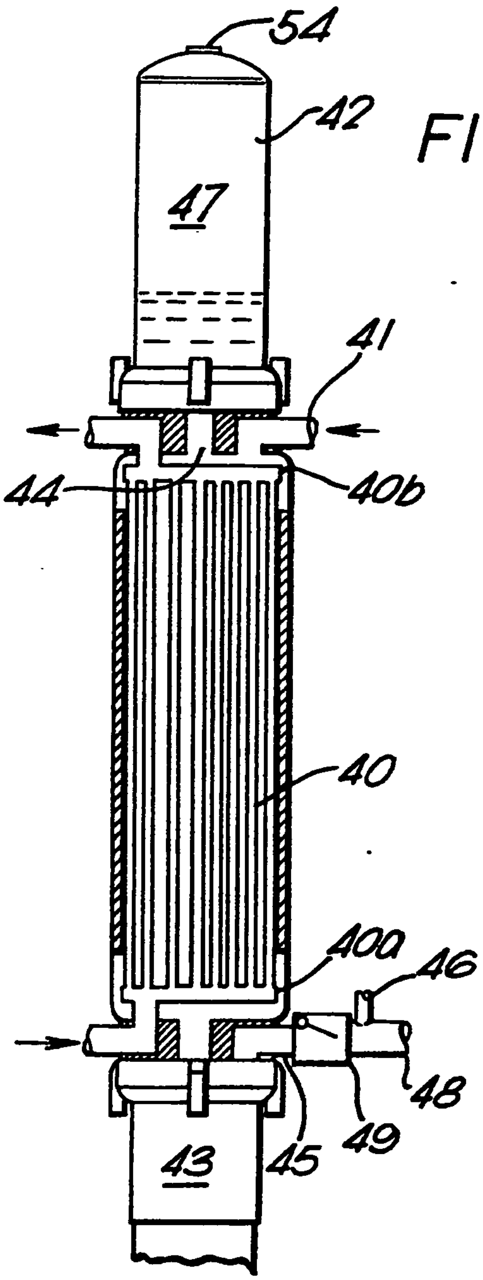


FIG. 4

FIG. 5A

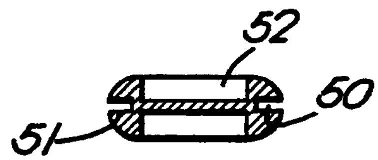
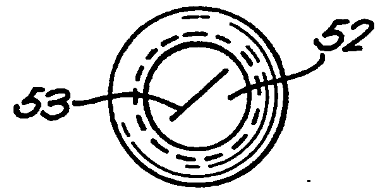


FIG. 5B



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HEAT EXCHANGE STATION

DESCRIPTION

This invention relates to a heat exchange station for a heating installation.

Pump/heat exchange units are known for system separation between a central boiler's circulation and a large-area heating system, e.g. floor heating or wall radiators. These units require an expansion tank which is installed above the unit and is in contact with the outside air. As a rule, installations of this kind cannot be accommodated in living rooms. Another disdvantage is that the large-area heating system cannot include any iron components as the atmospheric oxygen which is continuously being dissolved in the water, makes them rust. A frequently desired combination of a flat radiator under the window with a floor mounted heating system is therefore impossible. Moreover, because of their, as a rule, low volumetric flow rate, large-area heating elements often require special measures for bleeding them since air or gas

which develops in the system is not flushed away with the pumping medium.

According to the invention there is provided a heat exchange station for a heating installation, including a circulation pump, a heat exchanger and an expansion tank, wherein the circulation pump forms a single unit with the expansion tank, a pressure difference actuated valve is provided in the tank to release excess gas pressure therein and the heat exchanger in use thermally communicates with water in the expansion tank.

According to the invention, the three components - circulation pump, heat exchanger and expansion tank can be combined into one unit and in an embodiment of the invention described in more detail hereinafter, the circulation pump forms a unit with the expansion tank, which in turn accommodates the heat exchanger. The air chamber of the expansion tank is connected to the outside air by means of a pressure difference acutated valve which is permeable on both sides so that air is only expelled when the water level rises and introduced when the water level falls. Thus, only a few cubic

centimeters pass at any time into the expansion tank. Another measure to reduce oxygen adsorption to a safe level is that the expansion tank thermally communicates with the heat exchanger. The water supply of the expansion tank then assumes the general temperature of the circuit. This reduces the water's ability to absorb oxygen since this capacity declines as the temperature increases. Devices are furthermore provided which ensure that large-area heating systems are bled when they are filled for the first time.

For improved venting during operation, the exit point of the water flowing back from the large-area heating system to the tank is disposed as far away as possible from the intake region of the circulation pump so that air which also leaves from this exit point can separate in the tank, in which there is a relatively low flow rate, and water which is free of aira or gas is then taken in by the pump.

In order that the inveniton may be more fully understood embodiments thereof will now be described with reference to the drawings, in which;

Figure 1 shows a heat exhange station with a check valve;

Figure 2 shows a form of the invention which also includes a resistance heating system;

Figure 3 shows a unit with two separate circuits,

Figure 4 shows an arrangement with a bank of pipes; and

Figure 5 shows the pressure control valve.

Referring to Figure 1, there is shown a heat exchanger station for a central heating system, in which a primary circuit including a spiral heat exchanger pipe 5, receives a pumped primary supply of heated water from a central heating boiler (not shown). The spiral pipe 5 is arranged in a casing 4 having an open end 4A, mounted in an expansion tank 2 having a bottom surface 1. A pump 3 mounted on the bottom surface 1 of the tank 2 takes in water from the casing 4 heated by the heat exchanger pipe 5 and pumps it around two parallel secondary circuits which include radiators or other large-area heat exchangers (not shown) e.g. in a

domestic building. Flow to the radiators is fed from the delivery site 8 of the pump 3 through a check valve 9 and stop valves 10a, b. Return flow from the radiators is fed through metering valves 12a, b into the bottom 1 of the expansion tank 2. The valves 12a, b permit adjustment of the flow rates in the parallel secondary circuits.

A further stop valve 11 is provided to fill the system with water. The check valve 9 closes during the filling process so that the entire stream of water flows into the large-area heating system and the expansion tank 2 is also finally filled. The stop valve 11 is then closed. When the pump 3 starts to operate, the check valve 9 opens, permitting flow through the large area heating system. The arrangement of the return flow valves relative to the inlet 4a of the casing 4 results in separation from the water of gas evolution flowing back out of the metering valves 12a and 12b or of residual air as a result of the low flow rate in the expansion tank. The gas or air rises to the surface while air- and gas-free water is taken in through the cross-section 4a. This provides a

venting facility, essential for large-area heating systems.

In order to allow the liberated gas and air to escape from the expansion tank 2, it is provided with a rubber valve body 6 in its lid 2a. In use an air space 7 between water in the tank 2 and the lid is developed, and the valve 6 allows air to escape from the tank only upon the pressure in space 7 exceeding atmospheric.

Figure 2 illustrates a similar arrangement which requires an extremely low installation cross-section. The pump 23 is disposed on the side wall of the expansion tank 22, with all connections laid on the opposite side wall 24. An electric heating element 29 is used to heat the water during a transitional, start up period.

Figure 3 illustrates a modified arrangement having two pumps 33a and 33b which are connectible independently of one another. Two room areas may therefore be heated independently of one another.

Figure 4 illustrates an embodiment in which the heat exchanger is a generally cylindrical bank of pipes 40. A collecting chamber 40a is connected to the primary flow of the heating boiler circuit and collecting chamber 40b is connected to the boiler return flow. The return flow of the secondary circuit for the large-area heating system enters the connection duct 41, flows round the pipes of the bank of pipes 40 and then passes through intake opening 44 of pump 43, into the pump. Located downstream of pressure joint 45 there is a check valve 49, from where the circulation water of the secondary circuit passes by way of connection piece 48 into the flow of the large-area heating system. Filling is effect by way of connection piece 46 and air leaves by way of the rubber valve body 54 in the lid region of expansion tank 42 that is connected to the space around the pipes 40.

Figure 5 is a sectional view of the rubber valve body 54. A groove 50 in bead 51 is inserted in a bore. The diaphragm region 52 is slotted with a sharp lance along cutting line 53. The restoring forces of the two hemispherical regions thus formed are not overcome until the pressure difference between the secondary

circuit and the outside air exceeds a preset valve. Thus, the connection between the interior of the expansion tank and the outside air is in effect closed, except for the release of excess gas pressure from within the tank 42.

From the foregoing description, it will be seen that the invention provides a compact heat-exchange station which can readily be installed in a room of a domestic dwelling to distribute heat from a primary boiler circuit to a second circuit including room radiators of like heat exchangers.

CLAIMS

1. A heat exchange station for a heating installation, including a circulation pump, a heat exchanger and an expansion tank, wherein the circulation pump forms a single unit with the expansion tank, a pressure difference actuated valve is provided in the tank to release excess gas pressure therein and the heat exchanger in use thermally communicates with water in the expansion tank.

2. A heat exchange station according to claim 1, wherein the heat exchanger is disposed inside the expansion tank.

3. A heat exchange station according to claim 1, wherein the heat exchanger is cylindrical, the expansion tank is disposed above the heat exchanger, and the pump is disposed below the expansion tank.

4. A heat exchange station according to any preceding claim wherein the pump has an output connected to a flow line for the heating installation, a check valve is connected in the flow line, and water

filling means are connected to the flow line such that upon filling, the check valve closes and diverts water through the flow line rather than through the pump to fill the installation.

5. A heat exchange station according to any preceding claim including at least one return line connection to the tank to return water pumped by the pump around the heating installation, said return line connection being positioned such that gases released from the return water tend not to be entrained in an inlet flow to the pump.

6. A heat exchange station according to claim 5 wherein said return line connection comprises a metering valve.

7. A heat exchange station according to any preceding claim wherein said pressure difference actuated valve is permeable to gas in both directions.

8. A heat exchange station according to claim 7 wherein the pressure difference actuated valve comprises a split diaphragm which is surrounded by a bead.

9. A heat exchange station according to claim 2 wherein said heat exchanger comprises a spiral tube to receive hot water from a boiler, surrounded by a cylindrical casing connected at one end to the pump and open at the other end.

10. A heat exchange station substantially as hereinbefore described with reference to the accompanying drawings.

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